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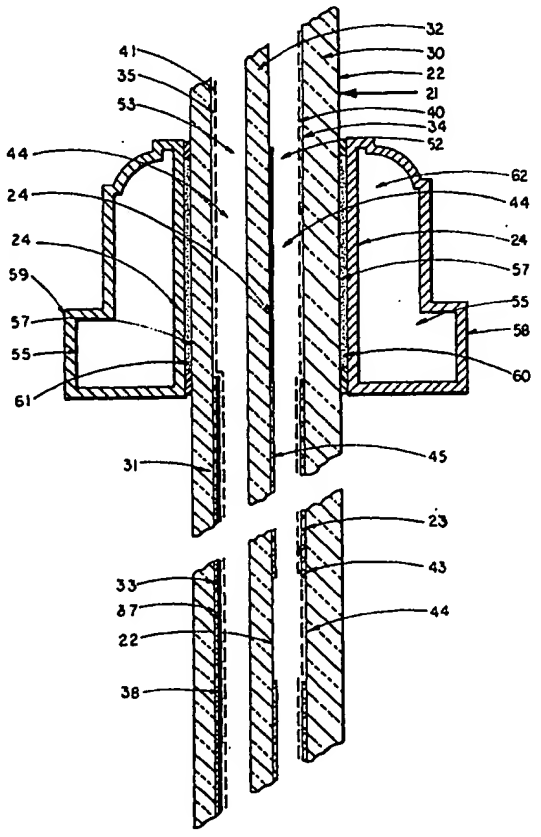
(54) Title: ARCHITECTURAL BUILDING PANEL

(57) Abstract

An architectural building panel comprises a sealed glazing unit (21) having at least two spaced apart parallel glazing sheets which define a cavity closed by a peripheral seal. Opaque strip elements (24) on the building panel provide the appearance of window frames surrounding transparent glass areas (22), the regions of the panel outside these frames being provided with surface area patterns (23, 33) that simulate the appearance of conventional building materials such as brick or the like. The building panel can be used in any convenient size, and e.g. may be of a size to extend between the structural floors of a building so that a curtain wall for the building can be composed of exteriors of such building panels.



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ARCHITECTURAL BUILDING PANEL

Prior Art:

US Patents

4,598.520	7/1986	Ellstrom	52/456
4,968,553	11/1990	Cesar	428/203
5,465,539	11/1995	Rose	52/204.53
5,494,715	02/1996	Glover	428/34

International Patents

WO 95 15267	Stained Glass Systems
WO 98 43832	Pearson

Field of Invention

This invention relates generally to architectural building panels and more specifically to building panels that incorporate multiple pane sealed glazing units with decorative features.

Description of the Prior Art

Conventional curtain wall cladding systems are non-load bearing walls that are suspended in front of the main structural frame of a building. Typically, a curtain wall system consists of a rectangular grid of vertical and horizontal metal framing members with infill panels of clear vision glass and opaque insulating panel assemblies that can be clad with a metal, tile, stone or glass facing.

Particularly in cold weather climates, there are a number of performance drawbacks with these conventional curtain wall systems. There are four main issues:

1. Because of the metal grid framing system, there can be substantial conductive heat loss particularly through the framing system and at the perimeter edges of the glazing units

and panel assemblies.

2. Because of the multi-component panel assembly, the jointing design for the air barrier and rain screen system can be very complex and prone to failure.

3. Particularly for elaborate heritage window designs, on-site installation can be very labor intensive.

4. Because of the need to insulate the panel wall assembly, the potential rentable interior space is reduced.

In US Patent 5,494,715 issued to Glover, there is a description of the various efforts that have been made in recent years to improve both the energy efficiency and condensation resistance of multiple glazed sealed units. These improvements include: low-e coatings, argon or krypton gas fill, insulating spacing-and-desiccant systems for perimeter edge seals and narrow-width cavities (approximately 3/8" spacing for argon gas filled units).

As also noted in US Patent 5,494,715, there is a growing consumer interest in heritage window features and these window features can include colonial style divided-lite windows, leaded or stained glass windows and decorative sun screens. These decorative features can be very labor intensive to produce and to simplify production, Glover describes how the visual illusion of these features can be created by means of decorative stripe patterns that are applied to two or more glazing sheets of a multiple glazed unit. Because of potential durability problems, the stripe material must be non-outgassing and with high volume production methods, experience has shown

that for typical coating materials, this is a very demanding technical requirement.

Various efforts have also been made to simulate the appearance of traditional building materials. US Patent 4,968,53, issued to Cesar, describes how a graphic laminate is created by heat laminating a printed sheet of extruded polyurethane between two plates of glass, using a conventional autoclave process. In WO 95/15267 issued to Stained Glass Systems, an alternative method for producing decorative glass panels is described where ceramic decals with printed designs simulating marble or other materials are applied to a glass sheet which is then heated so that the ceramic material is fused to the glass. In producing large decorated glass panels, a series of ceramic transfers are placed side-by-side. However, because of the need for high accuracy, this process is very labor intensive and cannot be easily automated.

In WO 98/43832,issued to Pearson, automated equipment for applying ceramic decals is described where heat release decals on a decal carrier are laminated to glass sheets. Unlike the automated decal stamp pad equipment developed by Service Engineers for Stained Glass Systems, (See Product Literature: Fully Automated Multi-Color Glass Decorative Machine Designed for In-line Production, Stained Glass Systems, September 1996), the decals are applied through a roller press system where glass sheets continuously pass through a laminating station.

Although large size panels can be produced by this

method, the individual large scale decals are conventionally printed and the manufacturing process is not suitable for the production of one-off custom products.

Summary of the Invention

The invention provides an architectural building panel in the form of a sealed glazed unit comprising: at least two spaced apart parallel coextensive glazing sheets; peripheral seals extending continuously between the edges of said glazing sheets to define an insulating cavity between each adjacent pair of said glazing sheets; surface area patterns on part of at least two surfaces of said glazing sheets; each said glazing sheet having a transparent area, the transparent areas of respective sheets being in alignment to define a window region; opaque strip elements located on a least two surfaces of said glazing sheets, said opaque strip elements surrounding said transparent area of the associated glazing sheet, said strip elements on different surfaces being in mutually aligned registration with each other and being of a width parallel to the glazing sheet surfaces that is sufficient to create the visual illusion of solid member within said cavity; wherein the combination of said transparent areas, said surface area patterns and said opaque strip elements simulate the appearance of a window incorporated within a building wall.

The sealed glazing unit consists of two or three glazing sheets that enclose one or two glazing cavities that are preferably filled with argon gas for improved energy efficiency. Also to provide for improved energy efficiency, a

low-e coating is preferably incorporated on at least one of the glazing cavity surfaces.

The strip patterns may preferably define window frames surrounding the transparent glass regions, and around the frames the surface area patterns may be designed to simulate almost any kind of surface finish, and in particular the appearance of traditional building materials such as bricks, stone, granite, marble and clay tile, etc., including mortar joints and the like.

The surface area patterns can be provided in any suitable manner, e.g. by the use of ceramic frit materials that can be deposited on the glass by means of heat transfer decals in roll or strip form; by printing these patterns on flexible plastic film material laminated to a cavity surface of one or more of the glazing sheets; or by printing them on flexible plastic film material from which the surface area patterns can be transferred to a plastic coating on one or more of the glazing sheets by means of a dye sublimation process.

The opaque strip elements can similarly be provided in many ways, e.g. by use of ceramic frit material; by printing on flexible plastic film material; by use of strips of flexible plastic sheet material adhered to the glass by means of a pre-applied pressure sensitive adhesive on the strips, or by use of shaped form members adhered to the exterior surfaces of the glazing sheets. In the latter case the shaped form members can be vacuum formed from plastic sheet material or may comprise hollow linear profiles. The shaped form members can be adhered

to the glazing sheets by means of double sided adhesive foam tape or otherwise.

However provided, the opaque strip elements are preferably designed to have one side that is of relatively light shade and an opposite side that is of relatively dark shade, and are attached to the glazing sheets in an orientation such that the side of the relatively dark shade is adjacent to the glazing cavity*. This, in conjunction with the relatively close spacing of the glazing sheets, creates the illusion that the opaque strip elements constitute solid window frame elements extending through the building panel.

Building panels as described herein are useful in many applications. One notable example is their potential for use in providing a curtain wall structure in multi-storey buildings. In this application, the panel will be sized to span the distance between the structural floors of the building. The glazing sheets will preferably be of heat strengthened or tempered glass. Also, it is advantageous for the exterior glass sheet of the building panel to be slightly enlarged, i.e. to have perimeter edges that extend slightly beyond the edges of the other glazing sheet or sheets providing peripheral support flanges. Rigid channels can be adhered to the support flanges by means of silicone sealant, and these channels can suitably be provided as fibreglass pultrusions.

Brief Description of the Drawings

The following is a description by way of example of certain embodiments of the present invention, reference being

made in the accompanying drawings, in which:

Figure 1 is a fragmentary exterior perspective view showing an architectural building panel that simulates the appearance of a window incorporated within a brick wall.

Figure 2 is a vertical cross section of the architectural building panel taken generally on the line II-II in Figure 1 showing the panel extending between structural floors of a high-rise building.

Figure 3 is an enlarged vertical cross-section detail of the region indicated by the circle A in Figure 2 showing the simulated window/wall junction;

Figure 4 is an enlarged vertical cross section detail of the region indicated by the circle B in Figure 2 and showing the jointing system between two building panels and the interface with the metal grid structure;

Figure 5 is a partially exploded perspective view of an architectural building panel that simulates the appearance of a traditional heritage window incorporated within a brick wall.

Figure 6 is a fragmentary perspective view of a triple glazed unit that simulates the appearance of marble and where there are different patterns on different surfaces of the glazing unit.

Figure 7 is a series of fragmentary plan views of the production steps for producing ceramic decorative patterns on a glass sheet.

Figure 8 is a fragmentary perspective view of a

double glazed building panel that graphically simulates the appearance of a window incorporated within a brick wall

Figure 9 is an enlarged cross sectional detail of the double glazed building panel illustrated in Figure 8 as seen on the line VIII-VIII.

Figure 10 is a fragmentary perspective view of a double glazed building panel with attached linear hollow profiles that simulates the appearance of a window within a brick wall.

Detailed Description

Figure 1 is a fragmentary exterior perspective view of an architectural building panel 20 that simulates the appearance of a window incorporated within a simulated brick-clad building wall.

The panel 20 consists of a triple glazed sealed unit 21 that incorporates a transparent area 22 and surrounding exterior surface patterned area 23 that simulates the appearance of clay bricks. Located between the transparent area 22 and the exterior surface pattern area 23 are opaque strip elements 24 that simulate the appearance of window frame profiles.

Figure 2 is a vertical cross section of the architectural building panel 20 taken generally on the line II-II in Figure 1 showing the panel 20 extending between structural floors 25 and 26 of a high-rise building 27. The panel 20 incorporates a triple glazed sealed unit 21 that is structurally adhered to a metal grid framing system 28 that is

mechanically connected to the building's main structural floors 25 and 26.

Figure 3 is an enlarged vertical cross section detail of the region indicated by the circle A in Figure 2. The triple-glazed sealed unit 21 consists of an exterior sheet 30, an interior glazing sheet 31 and a center glazing sheet 32. Surface patterns 23 and 33 are applied to cavity surface faces 34 and 35 of the exterior and interior glazing sheets 30 and 31.

The interior surface pattern 33 consists of an opaque decorative surface coating 37 which is typically a light shade that is generally backed by a second surface coating 38 that is typically a dark shade.

The exterior surface area pattern 23 consists of rectangular opaque areas 43 on the exterior cavity surface 34. Between the rectangular opaque areas 43, there are transparent margin areas 44 and so when the combined patterns are viewed at an angle, a three dimensional illusion is created of brick wall with traditional mortar joints.

The rectangular exterior surface area patterns can be textured with transparent voids within the surface pattern and optional surface coatings 45 can be applied to the center glazing sheet 32. The rectangular surface area pattern 43 located on the exterior glazing sheet 30 can be textured with transparent voids within the surface pattern. The optional surface coating 45 on the center glazing sheet 32 can be a different color and so when viewed from the exterior, the three

patterns in combination create the illusion of a textured surface.

Although a brick wall surface is shown in Figure 3, it can be appreciated by those skilled-in-the-art that the visual appearance of various other traditional building materials can be simulated including stone, granite, marble and clay tiles.

The surface coatings 23, 33 and 45 are fabricated from ceramic frit material that is fused to the glass sheets 30, 31 and 32 at high temperatures. After the ceramic coatings have been applied and the glass sheets 30, 31 and 32 have been tempered, sputtered low-e coatings 40 and 41 can be applied to the cavity surfaces 34 and 35. Although transparent, the low-e coatings 34 and 35 reduce radiative heat loss across the glazing cavities 52 and 53. To further reduce conductive heat loss, the glazing cavities 52 and 53 can be filled with argon gas. The width of the glazing cavities are typically about 12.5 mm although if the decorative window design incorporates narrow muntin bars or other similar details, the spacing can be reduced to 3/8" or less.

The width of the triple-glazed unit 21 is typically less than 2 inches. However, because of the various energy efficient features such as low-e coatings and argon gas and also because there is reduced perimeter heat loss through the window frames and spandral panels, these narrow width panels provide comparable insulating performance to conventional curtain wall assemblies where the width or thickness of the

wall is typically at least 6 inches. This potential reduced wall thickness is important because under most building zoning regulations, the allowable size of building is determined based on the exterior building dimensions while the rentable space is determined based on the interior building dimensions. Specifically when a slim wall cladding system is retrofitted to an existing building, the rentable space can be increased resulting in increased revenue to the building owner.

Typically, the exterior glazing sheet 30 is thicker than the interior and center glazing sheets 31 and 32 and this helps ensure that the exterior sheet remains flat and does not bow inwards or outwards due to pressure changes within the sealed glazing unit 21.

Opaque strip elements 24 are applied at the boundary areas 44 between transparent glazing areas 22 and the surface area patterns 23 and 33. The opaque strips 24 are generally in register with each other. Generally, the outward facing sides 58 and 59 of the opaque strip elements 24 are of a light shade while the inward facing sides 60 and 61 are typically of a dark shade with black being the preferred color.

The opaque strip elements 24 are of sufficient width that when viewed at an oblique angle, the visual illusion is created of a solid framing member that spans between the glazing sheets 31 and 30. Depending on the width of the opaque strip elements 24, an optional flat strip 62 can be applied to the center glazing sheet 32. The opaque strip elements can be made from various materials and as shown in Figure 3, one

option is for the opaque strip patterns to be made from hollow linear profiles 55 that are adhered to the outward facing sides of the glazing sheets 30 and 31 with two-sided adhesive foam tapes 57. The hollow linear profiles 55 are made from aluminum but various other materials can be used including: fibreglass, PVC plastic and wood. Typically, the two-sided adhesive tape is made from polyethylene foam and acrylic is the preferred material for the pressure sensitive adhesive.

Figure 4 is an enlarged vertical cross section detail of the region indicated by the circle B in Figure 2. There are two adjacent triple-glazed units 21 and 63 that are both structurally connected to a metal support frame 64. The triple-glazed units 21 and 63 are sealed at the perimeter edge using a tri-seal combination consisting of an inner flexible desiccant-filled, foam spacer 65 that is structurally adhered to the glass; an outer layer of structural thermosetting silicone sealant 66 and a layer of hot melt thermoplastic butyl 67 or polyisobutylene sealant sandwiched between the two structural seals 65 and 67. The key advantage of this tri-seal design is that as the glazing sheets 30, 31 and 32 flex back and forth, the butyl moisture/barrier seal remains firmly held against the glazing sheets 30, 31 and 32, and this ensures outstanding edge seal durability.

The exterior glazing sheet 30 extends about one inch beyond the edge seal creating a perimeter flange. A fibreglass channel 68 is structurally adhered to perimeter flanges 69 using structural silicone sealant 70. The fibreglass channel

68 is mechanically connected to the support frame 64 by means of a swivel toggle connector 71 and bolt 72. The outer rain screen joint between the two glazing units 21 and 63 is sealed by hollow silicone rubber extrusions 73 adhered to the perimeter edges 74 of the glazing sheets. The two inner air seal joints between the metal support frame 64 and the glazing units 21 and 63 are sealed by silicone sealant 75.

Figure 5 is a partially exploded perspective view of an architectural building panel 20 that simulates the appearance of a traditional heritage window incorporated within a simulated brick wall. The building panel 21 consists of a double glazed unit 76 with a window attachment 47 that is adhered to the sealed glazing unit with double sided pressure sensitive adhesive sheet foam. To provide for additional structural support, silicone sealant can also be used as a structural seal between the window attachment 47 and the exterior glazing sheet 30. The window attachment 47 is made from plastic sheet material such as polyethylene that is vacuum formed and which is coated with a durable material such as a fluoro elastomer coating. For improved rigidity, the window attachment can be foam filled with a light rigid foam material such as polyurethane.

Figure 6 is a fragmentary perspective view of a triple glazed unit that simulates the appearance of polished marble stone. The exterior glazing sheet 30 incorporates a series of decorative patterns 78 that are located on the glazing cavity face 34 and which simulate in part the

appearance of specific colored features of a particular marble stone.

The center glazing sheet 32 incorporates a second and different series of decorative patterns 79 that also simulate the appearance of other features of the marble stone. The third interior glazing sheet 31 can also incorporate a third and different series of decorative patterns 80 that are located on the glazing cavity surface 35 and that also simulate the appearance of additional colored features of a particular marble stone. Particularly when viewed at a distance, the three overlapping patterns 78, 79 and 80 collectively simulate the rich textured appearance of polished marble.

Although a marble surface pattern is given as an example in Figure 6, it can be appreciated by those skilled-in-the-art that other decorative textured surface finishes can also be simulated with different surface patterns being applied to multiple glazing layers.

The ceramic decorative patterns shown in Figures 1-6 can be produced in various ways. One option is to directly apply the ceramic patterns to the glass sheets using conventional silk screen printing processes. Although because of the limitations of the silk screen printing process, there is a need for relatively high volume printing runs and as a result, the building panel designs generally have to be standardized.

A second option is to produce the ceramic decorative patterns using a single large scale decal that is applied using

a heat transfer process. Again, because of the limitations of the decal printing processes which are presently available, the building panel designs generally have to be standardized. Although in the future these limitations may be overcome with the development of ink jet printers suitable for ceramic inks.

A third option is to assemble the decorative patterns from a series of decal strips that are separately applied to the glass sheet while the glass sheet is in a stationary position. The width of the decal strips can vary and can be as wide as typical wallpaper rolls. The decal strips can be produced by various printing processes and one preferred option is to use a rotor gravure process.

Figure 7 shows a series of fragmentary plan views of the production steps for producing custom decorative patterns of ceramic frit material on a glass sheet 31 that is in a stationary position.

Figure 7(i) shows the application of a single decal strip 81 incorporating opaque rectangular patterns 43 where the strip 81 is applied using a heated roller that moves horizontally or vertically across the glass sheet 31.

Figure 7(ii) shows the application of a second decal strip 82 incorporating opaque rectangular patterns 43 that is located about a half inch away from the first strip 81 and where the transparent margins 84 between the rectangular patterns 43 are located at about the centre line of the rectangular patterns 43 on the first decal strip 81.

Figure 7(iii) shows the application of a third decal

strip 85 where the strip is cut off at the mid point 86 of the second rectangular pattern.

Figure 7 (iv) shows the application of additional decal strips 87 that are cut-off to form a transparent area 23. Because the opaque rectangular pattern elements are separated by a transparent margin, there is no need to very accurately match up the patterns at the decal edges and large customized panel designs can be easily and efficiently manufactured. The width of the decal strips can vary and can be as wide as a typical wallpaper rolls with the larger size rolls incorporating a series of rectangular patterns side by side.

Figure 7(v) shows the application of an optional perimeter strip 88 around the perimeter of a large transparent area 23. The linear perimeter strip of ceramic frit material can feature one side that is a light shade and the other side that is a dark shade.

Figure 8 is a perspective view of an architectural building panel 20 that simulates the appearance of a window incorporated within a simulated brick wall. The building panel consists of a double glazed unit 76 with a transparent area 22, exterior and interior surface area patterns 23 and 33 and opaque strip elements 24 that divided the transparent area 22 from the exterior and interior surface area patterns 23 and 33.

The exterior pattern 23 consists of rectangular opaque areas 43 and between the rectangular opaque areas, there are transparent margin areas 44. The interior surface patterns 33 typically consist of light and dark shade patterns 61 where

the light shade patterns face the building interior (not shown) and the dark shade pattern 61 face the glazing cavity. When viewed from the exterior, the two surface patterns 23 and 33 create a three dimensional illusion of a brick wall with traditional mortar joints. At the boundary areas between the transparent glazing areas 22 and the surface patterns 23 and 33, there are opaque strip patterns 24. The two opaque strip patterns 24 are generally in register with each other. Typically, the outward facing sides 58 and 59 of the opaque strip elements are of a light shade while the inward facing sides 60 and 61 are a dark shade with black being the preferred color.

Figure 9 is an enlarged cross sectional detail of the double glazed panel illustrated in Figure 8 as seen on the line VIII-VIII. For the interior glazing sheet 31, the various opaque and surface pattern areas are produced by first printing the light shade patterns 89 to a transparent adhesive plastic film sheet material 90. A second transparent adhesive film sheet 91 is laminated to the first film sheet 90 with the dark shade patterns 92 being printed where appropriate in register with the light shade patterns 89. The double layer plastic film sheet material 93 is then laminated to the cavity face of the rigid interior glazing sheet 31.

For the exterior glazing sheet 30, the various light shade surface patterns 93 are first printed on a transparent adhesive film sheet 94. A second film sheet 95 is laminated to the first film sheet 94 with the dark shade patterns 96 being

printed where appropriate in register with the light shade patterns 93. The double layer plastic film sheet material 98 is then laminated to the rigid exterior glazing sheet 30. A pre-applied low-e coating 97 may be incorporated on the cavity surface of the second film sheet 95.

The preferred material for the plastic film material is polyethylene terephthalate (PET) and the preferred material for the adhesive is an optically clear, pressure sensitive acrylic adhesive. The various printed patterns are typically produced using pigmented ink and large format ink jet printers.

To prevent color fading, the plastic film adjacent to the exterior glazing sheet incorporates UV-absorbing material. As a further measure to prevent color fading, the glazing cavity 52 can be filled with argon gas and the perimeter edge-seal can incorporate oxygen-scavenging material to remove all oxygen from the glazing cavity.

Instead of laminating printed plastic sheet material to the glazing cavity surfaces, the decorative opaque and patterned areas can be produced through various other methods. For example, decorative patterns can be printed on a flexible plastic film that is suspended within the glazing cavity. Alternatively, one or more of the glazing sheets can incorporate a plastic polyester coating on the cavity glazing face. The decorative patterns can be printed on paper and then transferred to the glazing sheet through a dye sublimation process.

A further alternative option is to create the

decorative patterns from strips or rolls of plastic sheet material that are adhered to the glazing sheets with pre-applied pressure sensitive adhesive. These adhesive strips can be fabricated from plastic sheet material that features a light shade on one side and a dark shade on the other.

Figure 10 is a perspective view of an architectural building panel that is similar in construction to the building panel shown in Figure 8 except that the opaque strip elements 24 that surround the transparent area 22 are hollow linear profiles that are adhered to the glazing sheets 30 and 31 with pressure sensitive adhesive.

Claims:

1. An architectural building panel in the form of a sealed glazed unit comprising;

at least two or more spaced apart parallel coextensive glazing sheets;

peripheral seals extending continuously between the edges of said glazing sheets to define an insulating cavity between each adjacent pair of said glazing sheets;

surface area patterns on part of at least two surfaces of said glazing sheets;

each said glazing sheet having a transparent area, the transparent areas of respective sheets being in alignment to define a window region;

opaque stripe elements located on at least two surfaces of said glazing sheets, said opaque stripe patterns surrounding said transparent area of the associated glazing sheet, said strip elements on different surfaces being in mutually aligned registration with each other and being of a width parallel to the glazing sheet surfaces that is sufficient to create the visual illusion of solid members within said cavity;

wherein the combination of said transparent areas, said surface area patterns and said opaque strip elements simulate the appearance of a window

incorporated within a building wall.

2. The building panel of Claim 1 wherein said sealed unit is a double glazed unit.

3. The building panel of Claim 1 wherein said sealed unit is a triple glazed unit.

4. The building panel of claim 1 wherein a low-e coating is applied to at least one cavity surface of said glazing sheets.

5. The building panel of any one of claims 1 to 4 wherein at least one said cavity is filled with argon gas.

6. The building panel of any one of claims 1 to 4 wherein said sealed unit is sized to extend between the structural floors of a building.

7. The building panel of Claim 6 wherein said glazing sheets are heat strengthened or tempered glass.

8. The building panel of any one of claims 1 to 7 wherein said peripheral edge seal incorporates a flexible insulating foam spacer.

9. The building panel of any one of claims 1 to 8

wherein one said glazing sheet is designated as an exterior glazing sheet and has perimeter edges that extend beyond the other glazing sheet or sheets creating support flanges, and wherein rigid channels are adhered to said support flanges with silicone sealant.

10. The building panel of Claim 9 wherein said channels are made from fibreglass pultrusions.

11. The building panel of any one of claims 1 to 10 wherein said surface area patterns simulate the appearance of traditional building materials and comprise two or more different patterns on two or more surfaces of said glazing sheets.

12. The building panel of Claim 11 wherein said surface area patterns include a series of rectangular-shaped opaque elements on one glazing surface and an opaque surface area pattern on a second glazing surface and wherein said surface patterns in combination simulate the appearance of building materials with traditional mortar joints, these materials including brick, stone, granite, marble and clay tile.

13. The building panel of Claim 11 wherein on the glazing sheet adjacent to the building interior there is a surface area pattern, one side that is of a relatively light shade and on the opposite side there is a surface area pattern that is of a

relatively dark shade, said surface elements being arranged so that the relatively light shade is presented towards the building interior while said relatively dark shade is presented towards the building exterior.

14. The building panel of any one of claims 1 to 13 wherein said surface area patterns are made from ceramic frit material.

15. The building panel of any one of claims 1 to 13 wherein said surface area patterns are printed on flexible plastic film material laminated to one or more cavity surface faces of said glazing sheets.

16. The building panel of any one of claims 1 to 15 wherein said surface area patterns are printed on a flexible plastic film material and transferred to a plastic coating on one or more surfaces of said glazing sheets by means of a dye sublimation process.

17. The building panel of any one of claims 1 to 16 wherein each said opaque strip element has one side that is of a relatively light shade and an opposite side that is of a relatively dark shade, said elements being attached to said glazing sheets in an orientation such that the side of relatively light shade is presented towards the adjacent exterior side of the glazing unit whereas the side of

relatively dark shade is presented towards the opposite side.

18. The building panel of any one of claims 1 to 17 wherein said opaque strip elements are made from ceramic frit material.

19. The building panel of any one of claims 1 to 16 wherein said opaque strip elements are made from strips of flexible plastic sheet material adhered to said glazing sheets by means of a pre-applied pressure sensitive adhesive on said strips.

20. The building panel of any one of claims 1 to 16 wherein said opaque strip elements comprise shaped form members adhered to said glazing sheets.

21. The building panel of Claim 20 wherein said shaped form members are vacuum formed from plastic sheet material.

22. The building panel of Claim 20 wherein said shaped form members comprise a plurality of hollow linear profiles.

23. The building panel as claimed in Claim 20 wherein said shaped members are adhered to said glazing sheets with double sided adhesive foam tape.

24. The building panel of any one of claims 1 to 23

wherein said surface patterns are made from ceramic frit materials and wherein said ceramic frit material is deposited on a glass sheet that is in a stationary position using heat transfer decals that are generally in strip or roll form.

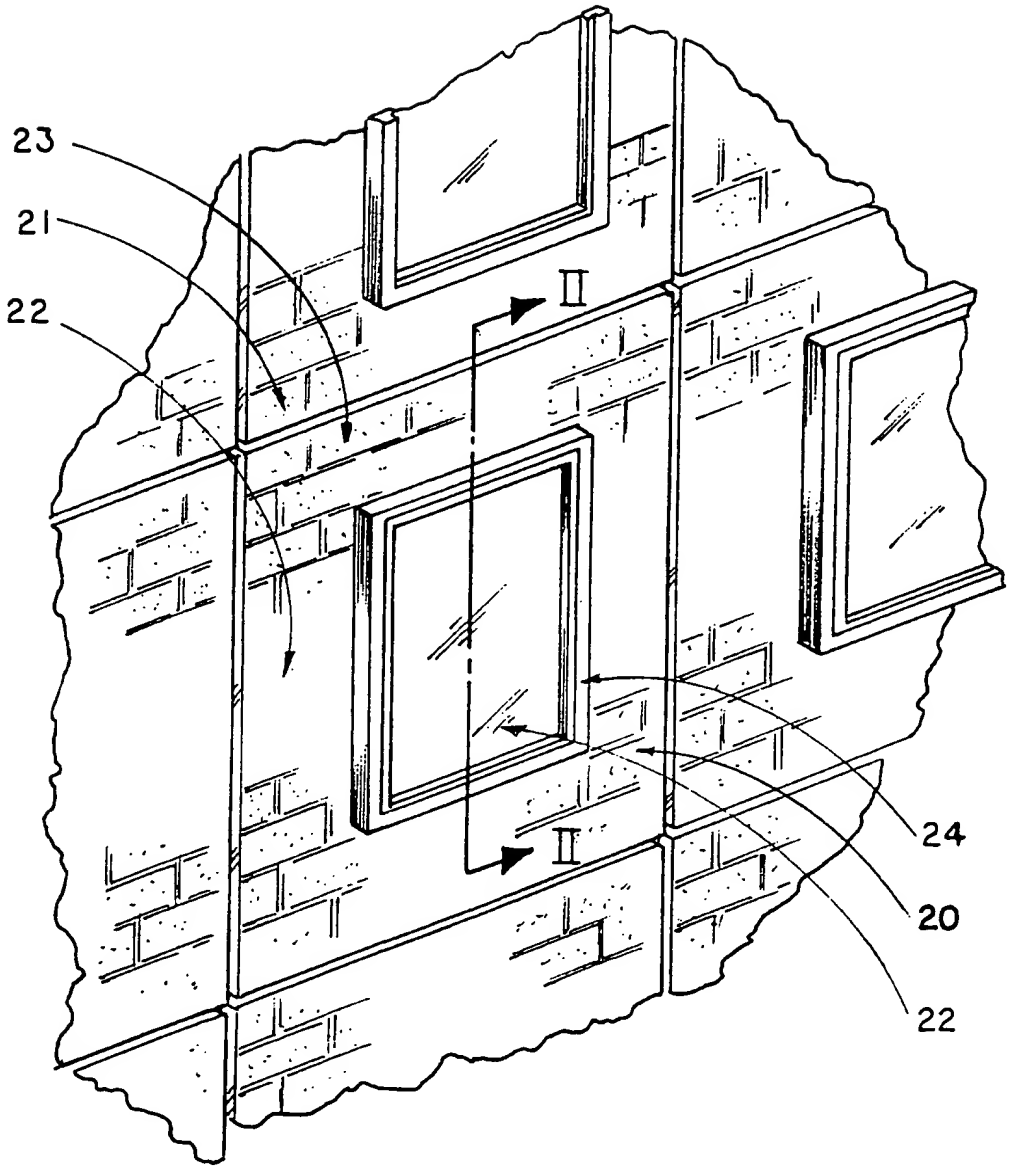

FIGURE 1

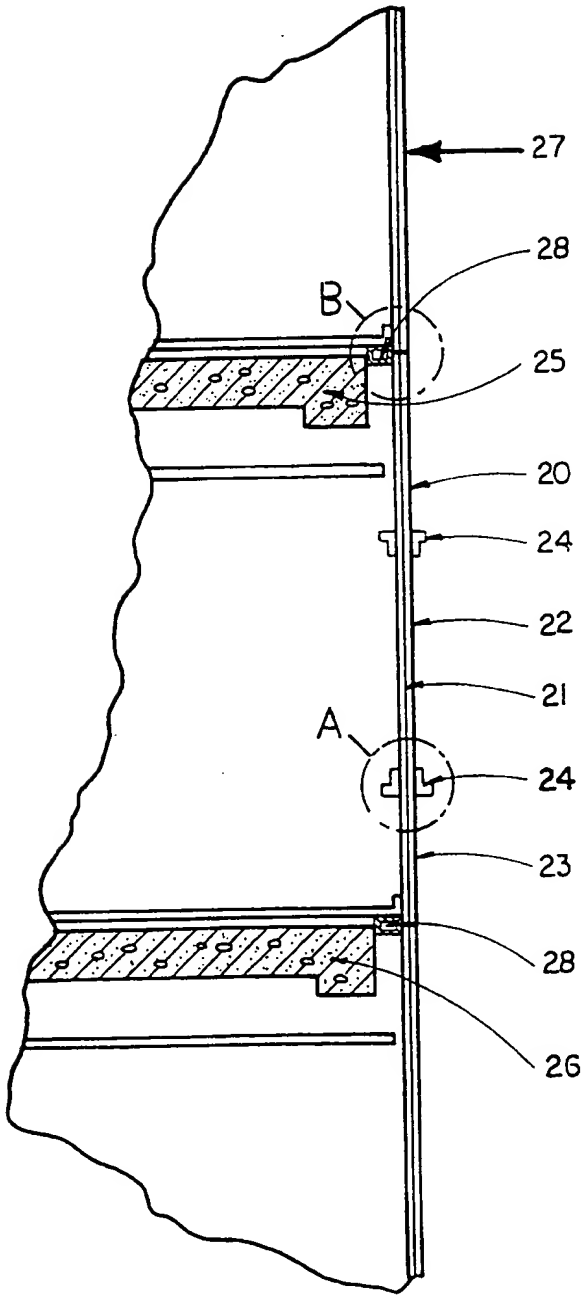

FIGURE 2

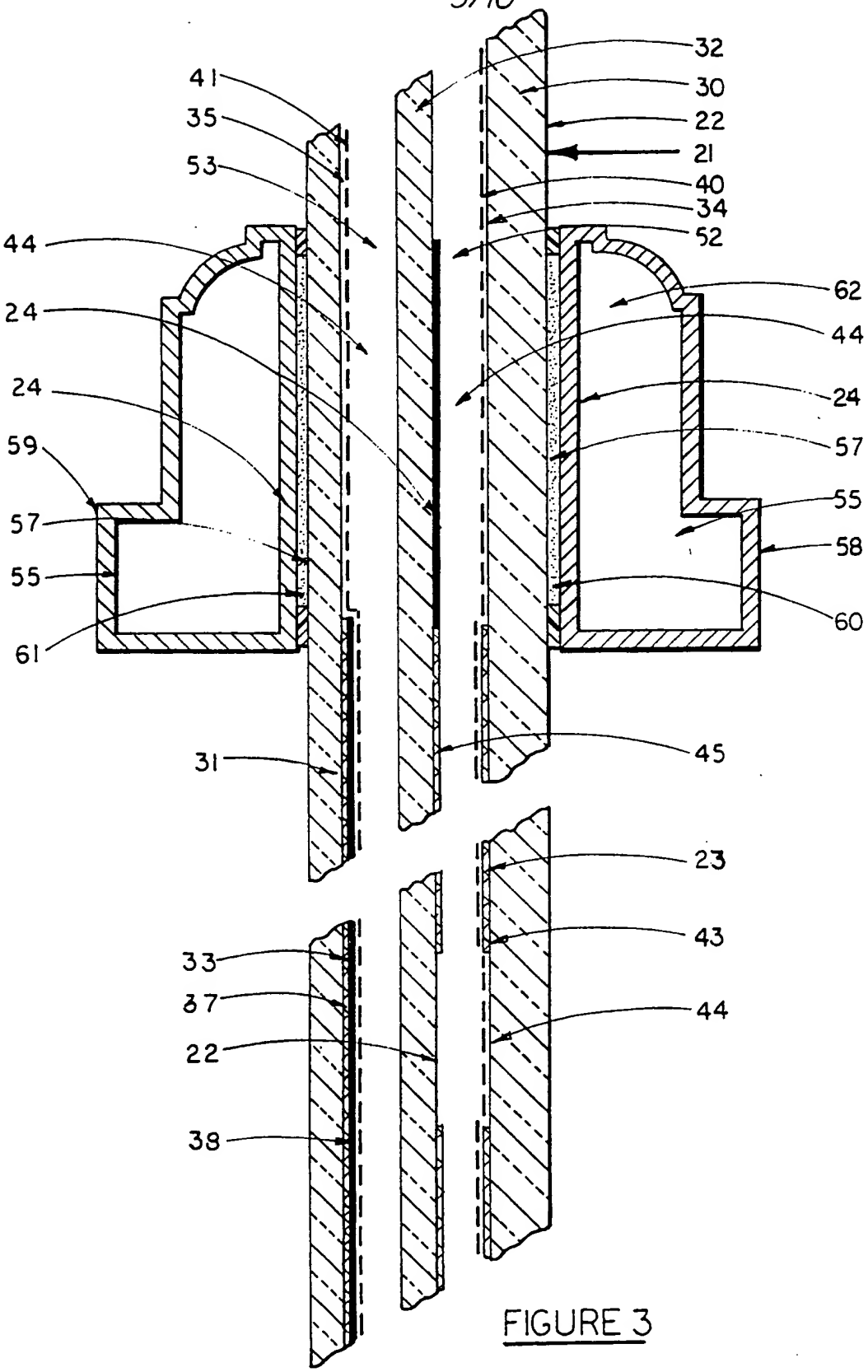
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FIGURE 3

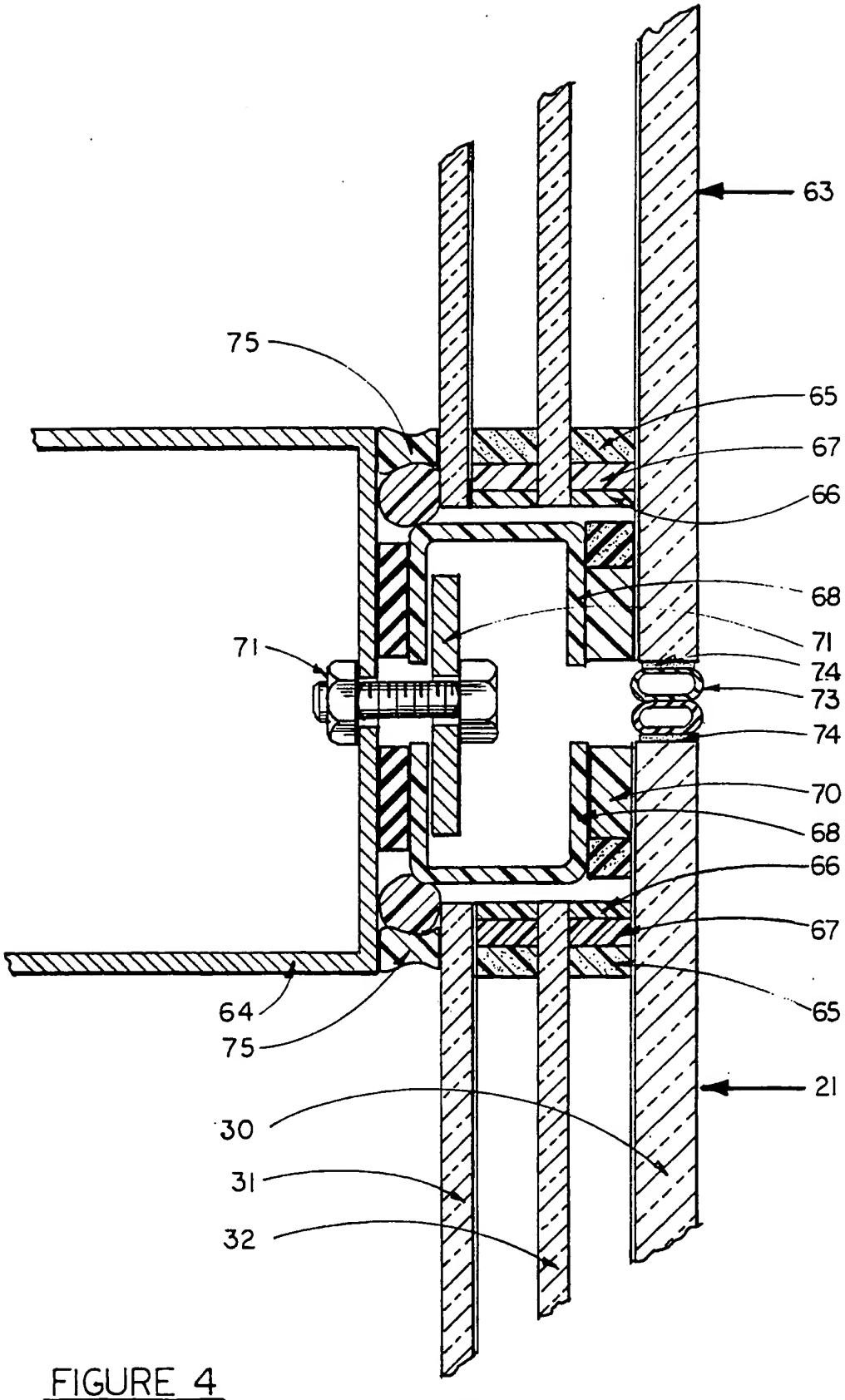

FIGURE 4

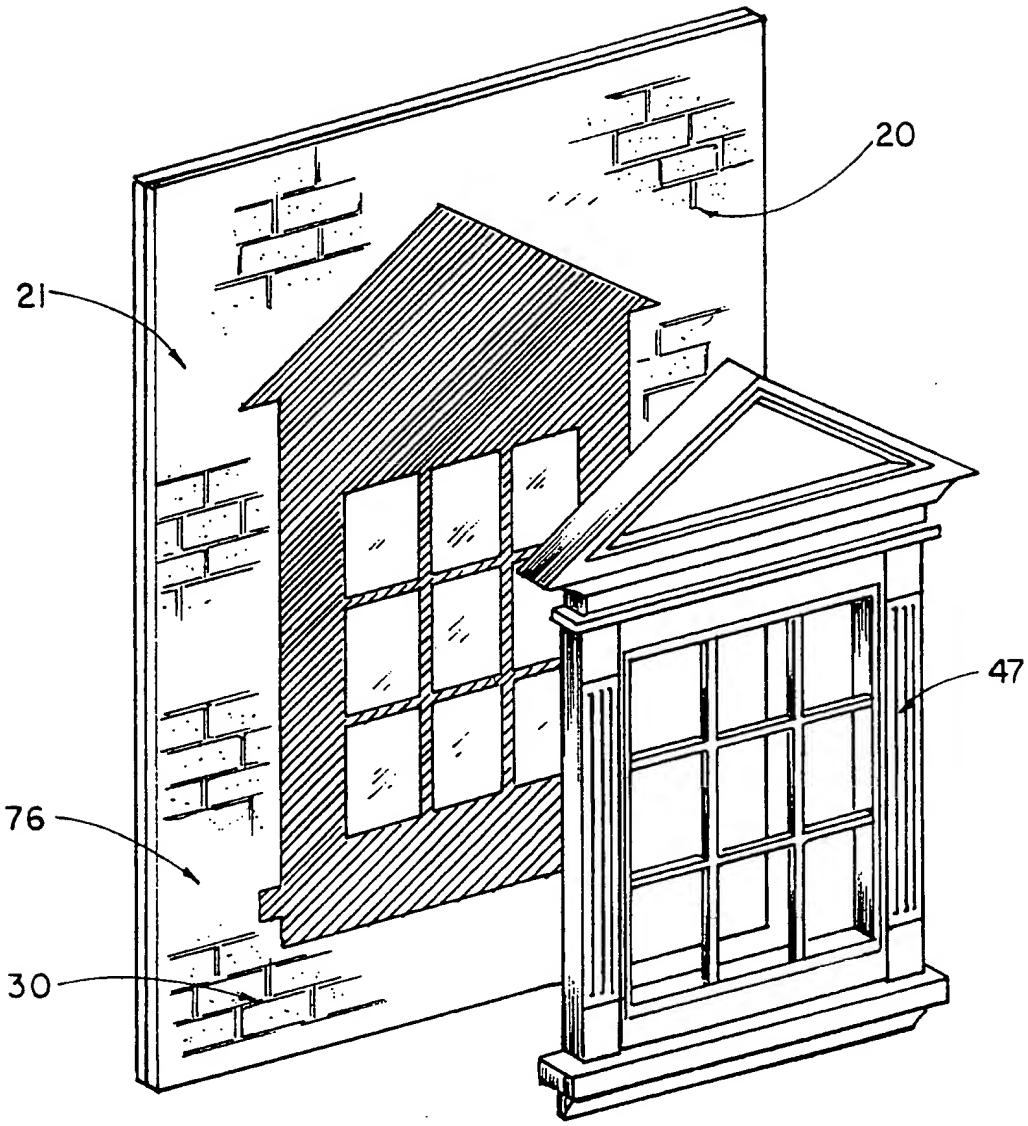

FIGURE 5

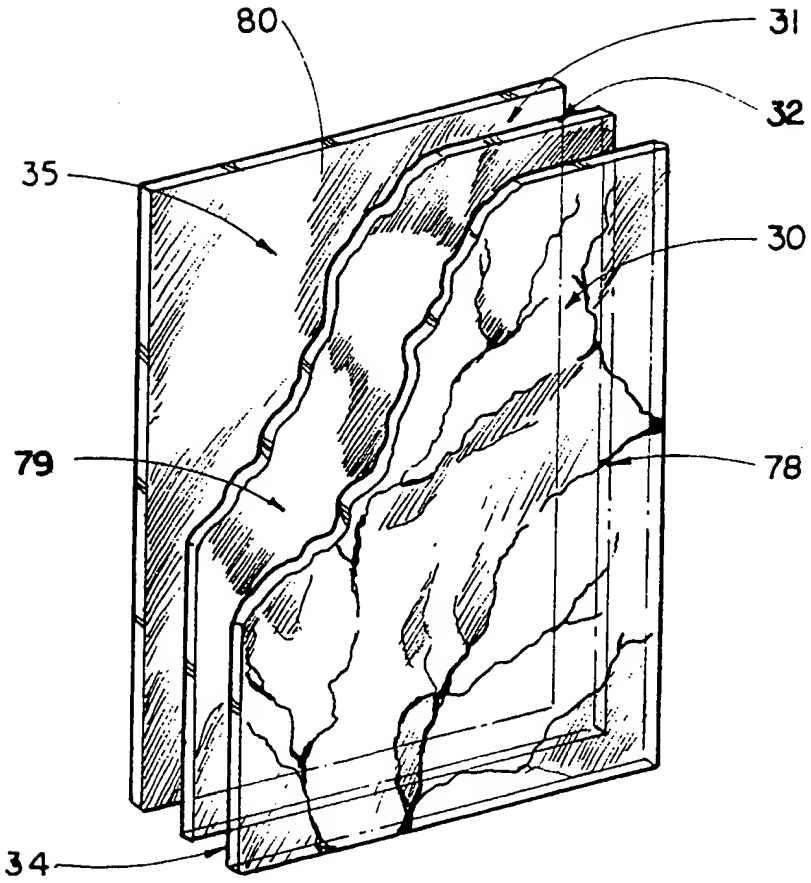

FIGURE 6

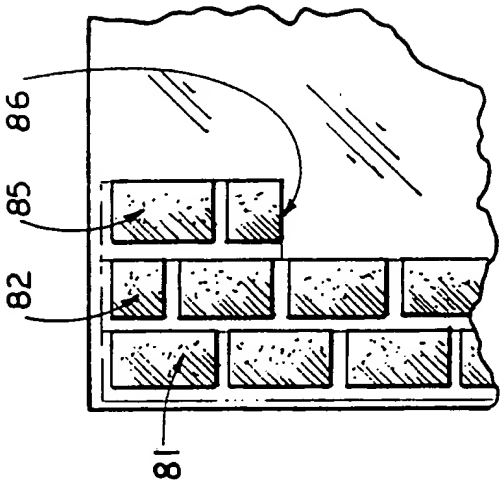

FIGURE 7iii

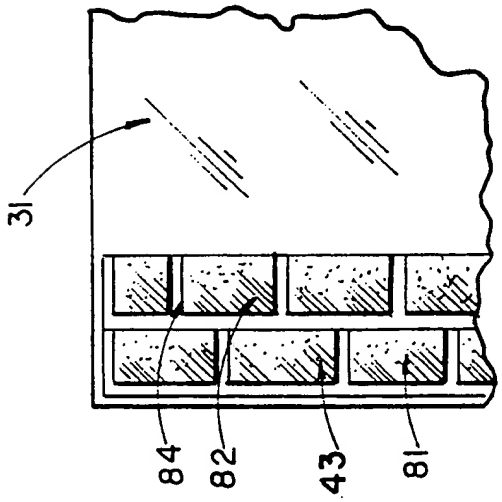

FIGURE 7ii

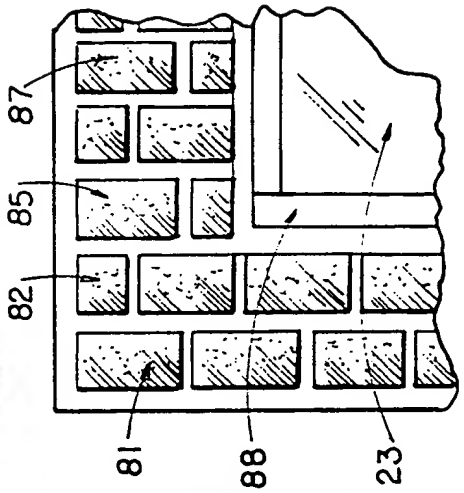

FIGURE 7 v

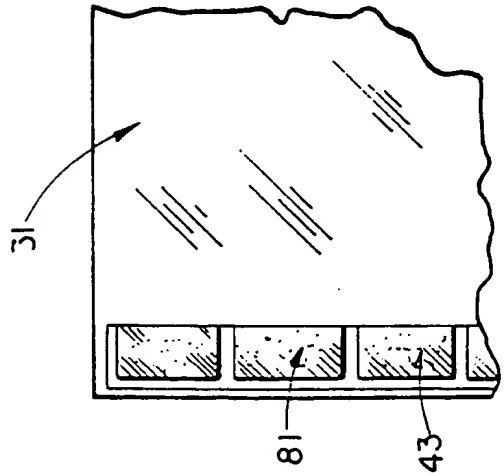

FIGURE 7 i

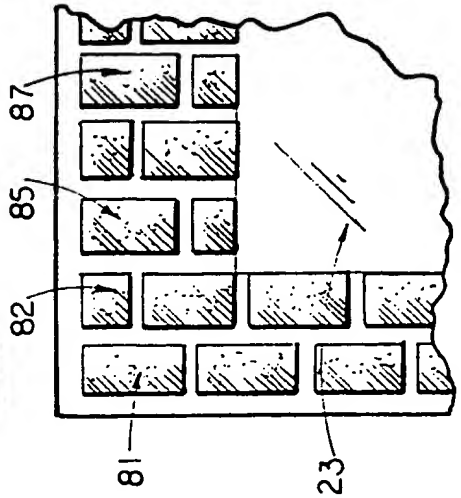

FIGURE 7 iv

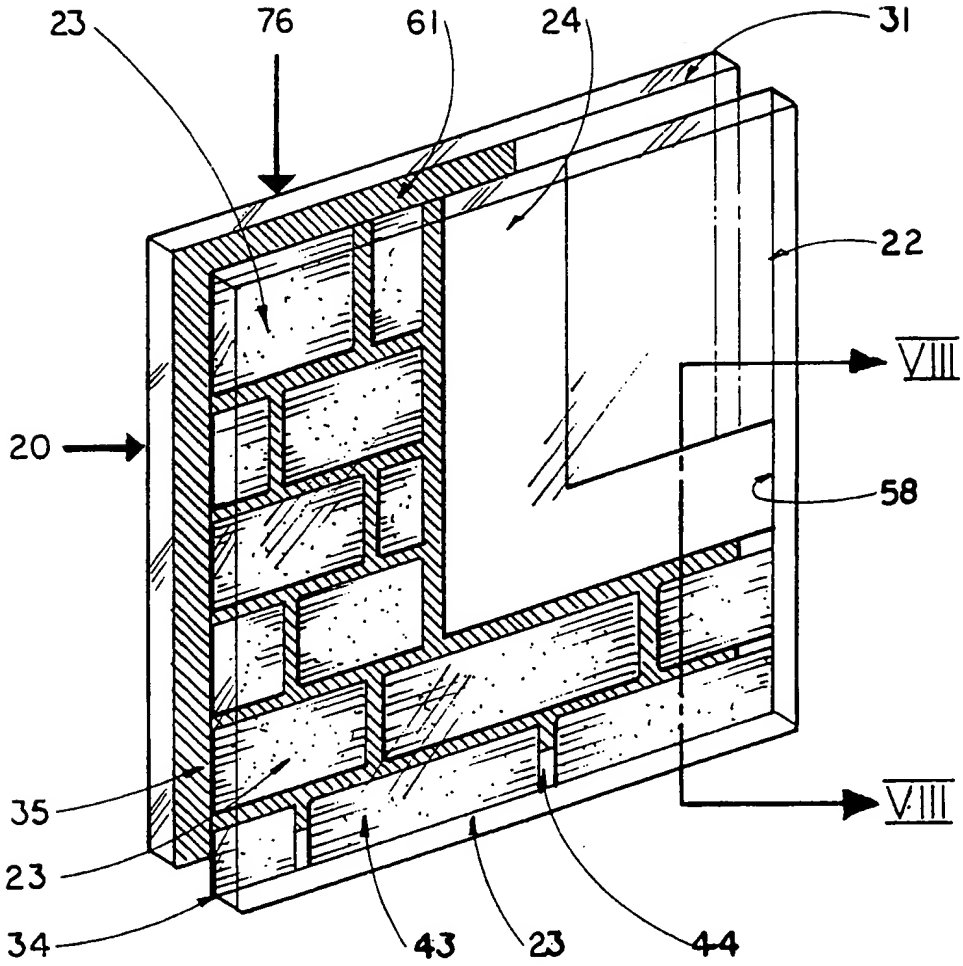

FIGURE 8

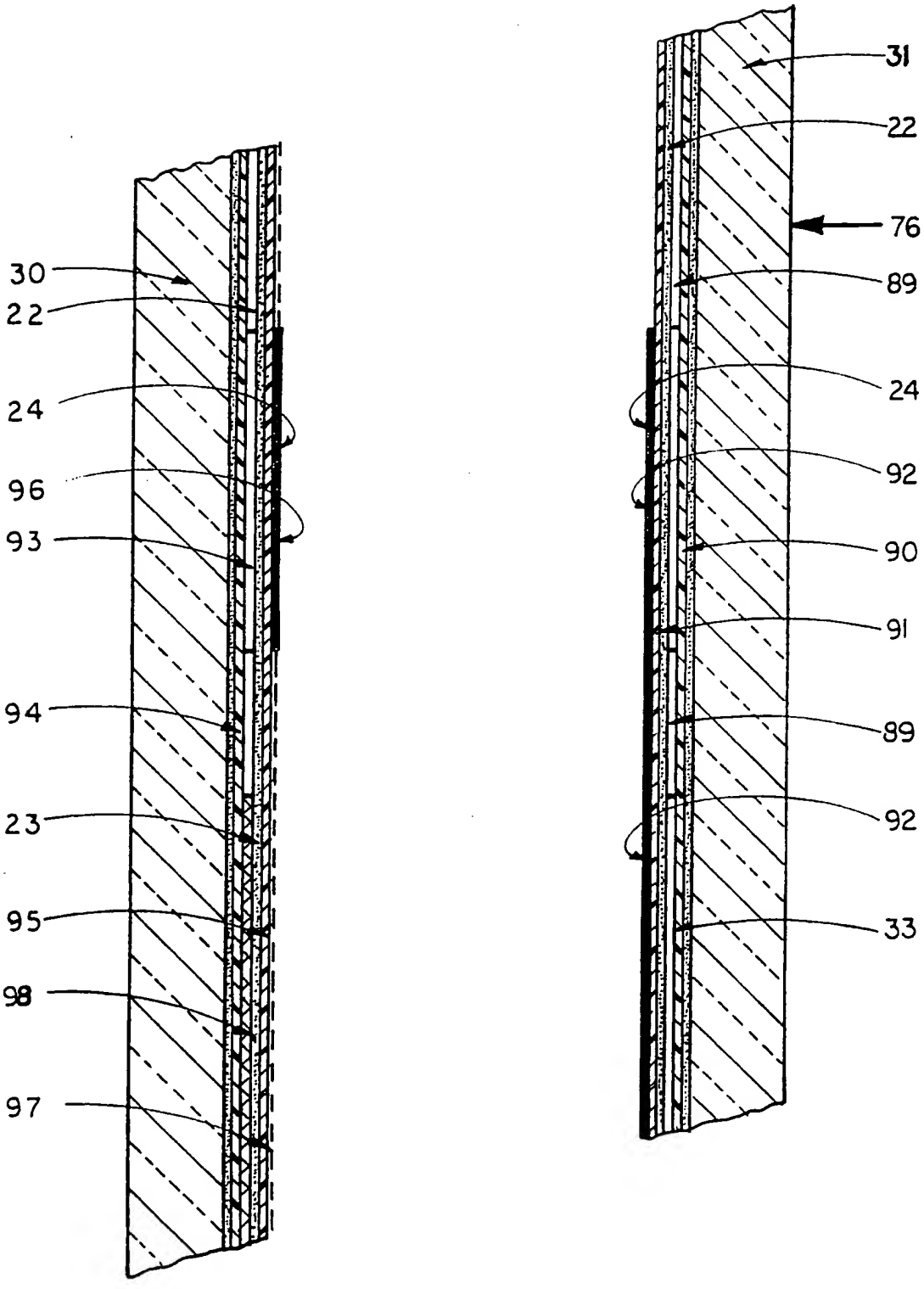

FIGURE 9

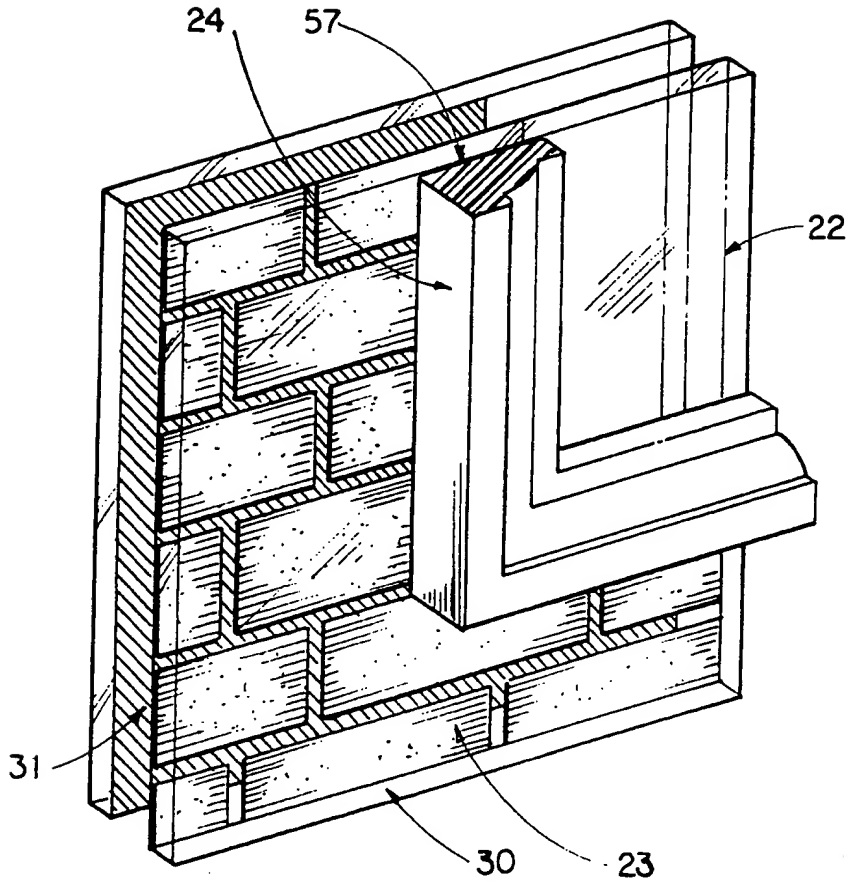

FIGURE 10

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/CA 98/01181

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E06B3/66 E06B3/68 E04B2/96

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	DE 33 34 859 A (CONZELMANN FLACHGLAS) 11 April 1985 (1985-04-11) page 4, paragraph 2 - page 8, paragraph 1; figures ---	1,2,6, 15,20 7,8,14, 15,22
X Y	DE 295 05 223 U (LILGE HELMUT) 1 June 1995 (1995-06-01) the whole document ---	1-3,15, 20 4,5,9
Y	CA 2 071 682 A (HYALIN INC) 20 December 1993 (1993-12-20) page 1, line 18 - page 5, line 17; figures ---	4,5
Y A	US 4 610 115 A (THOMPSON JR ALBERT E) 9 September 1986 (1986-09-09) column 2, line 23 - column 7, line 31; figures --- -/--	7,14,15 1-4,11

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
9 August 1999	23/08/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Depoorter, F

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INTERNATIONAL SEARCH REPORT

In tional Application No
PCT/CA 98/01181

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	the whole document	1,3-5, 17,18
Y	US 4 803 817 A (WHITE HAROLD J ET AL) 14 February 1989 (1989-02-14) column 3, line 1 - line 24; figure 6	9
Y	DE 90 14 993 U (ADAMS) 14 February 1991 (1991-02-14) the whole document	22
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